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(54) Connector element

(57) A U-shaped connector element (1) for the belt ends of conveyor belts has openings in its shanks (2, 3) for receiving staple-like securing means (5), as well as projections (6, 7, 8) on the sides of the shanks facing each other. These projections extend perpendicularly to the longitudinal direction of the shanks, and can be pressed into the belt surface. At least two projections are arranged on each shank, one behind the other as viewed in the shank's longitudinal direction. The projections protrude sideways beyond the shanks, and their free ends form an intermeshing arrangement with the shanks of neighbouring connector elements. These projections may extend at a right angle or at a slant across the length of the respective shank.

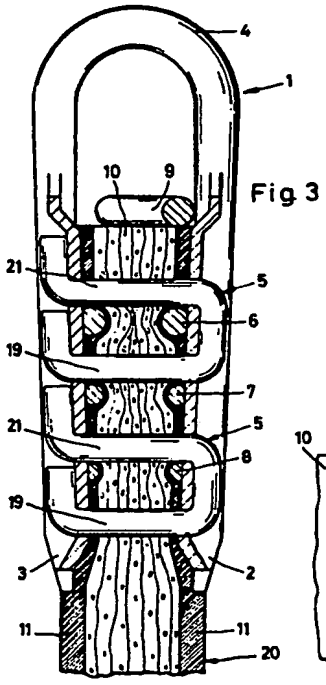

Fig 3

Fig 5

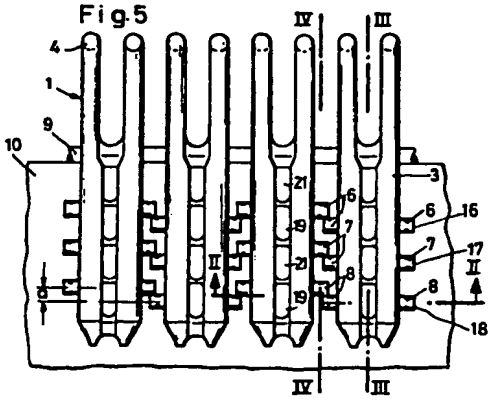

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Fig.1

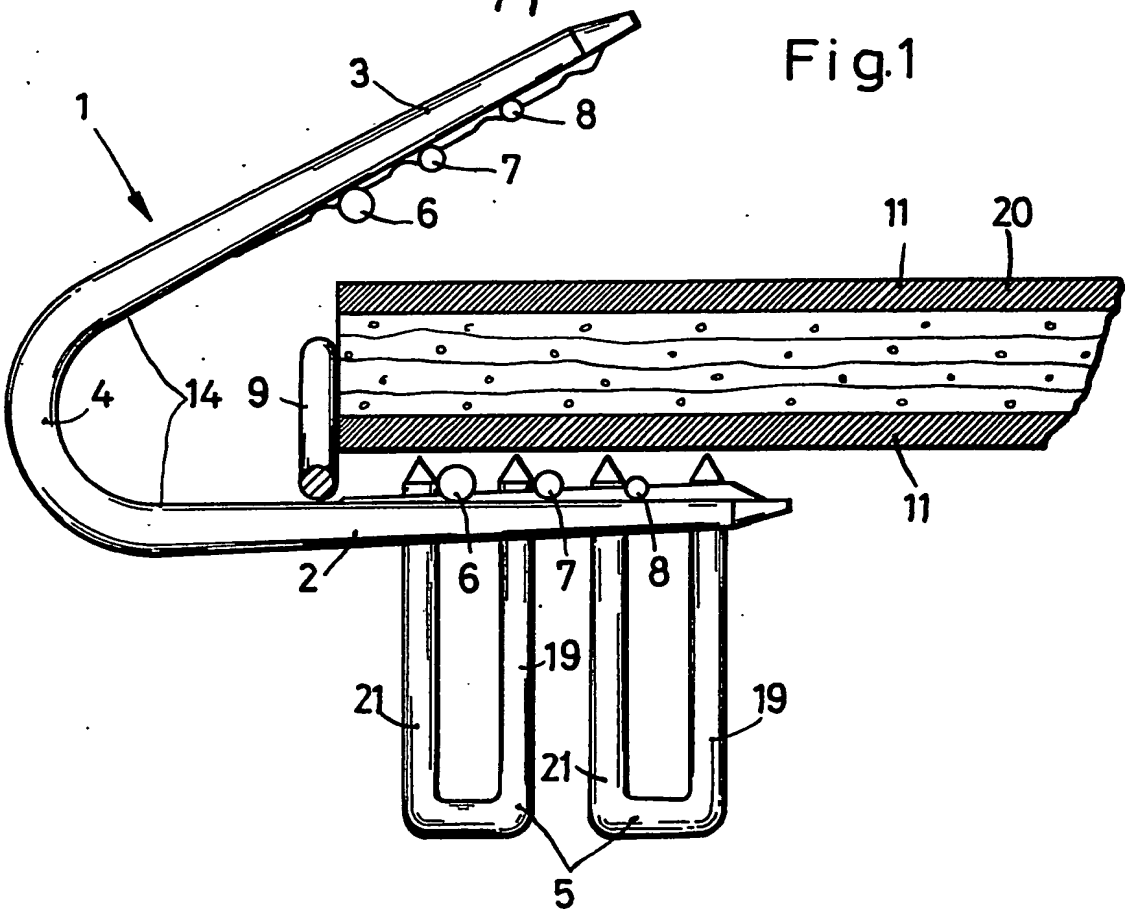
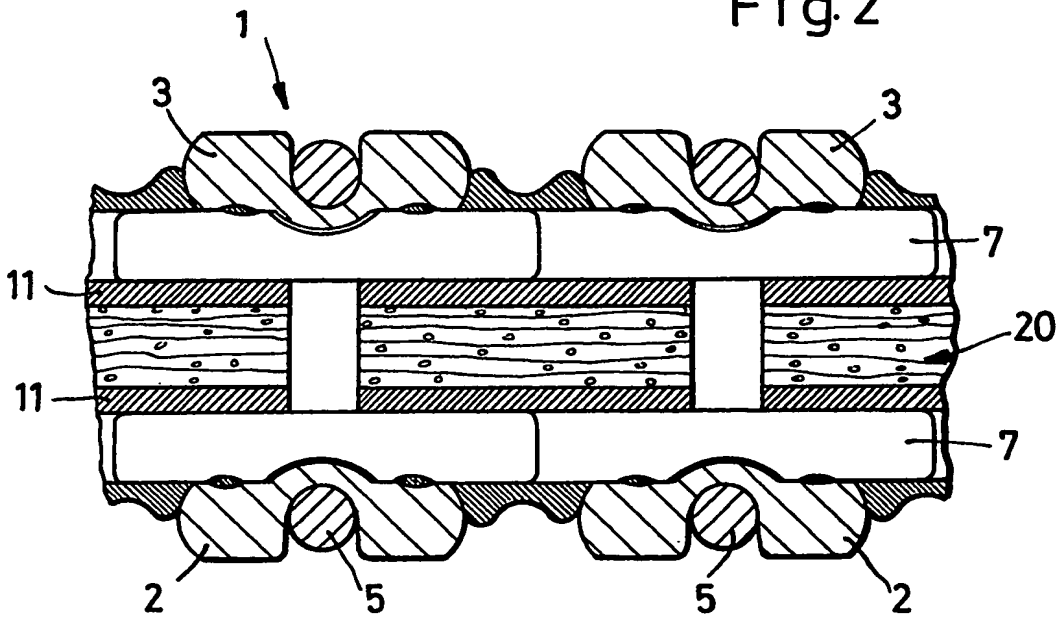


Fig.2



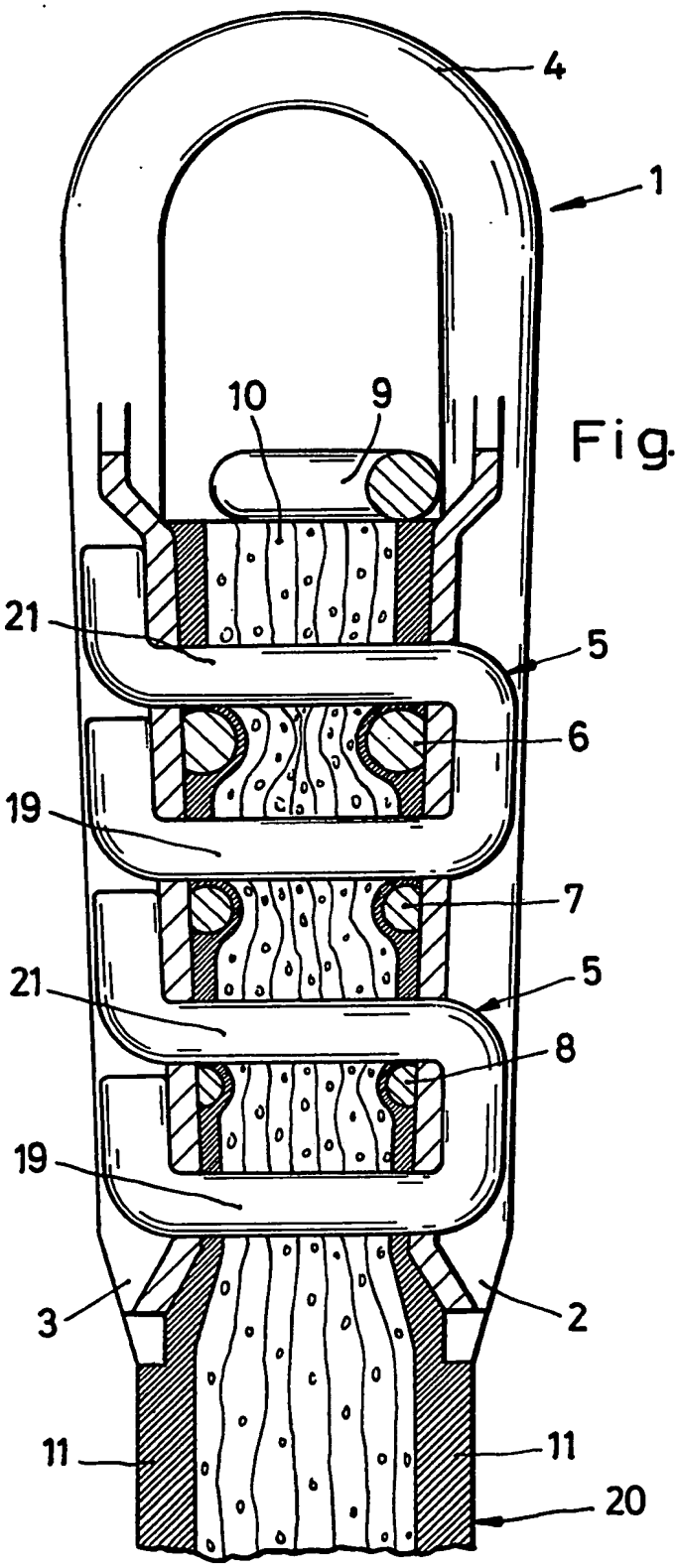


Fig. 3

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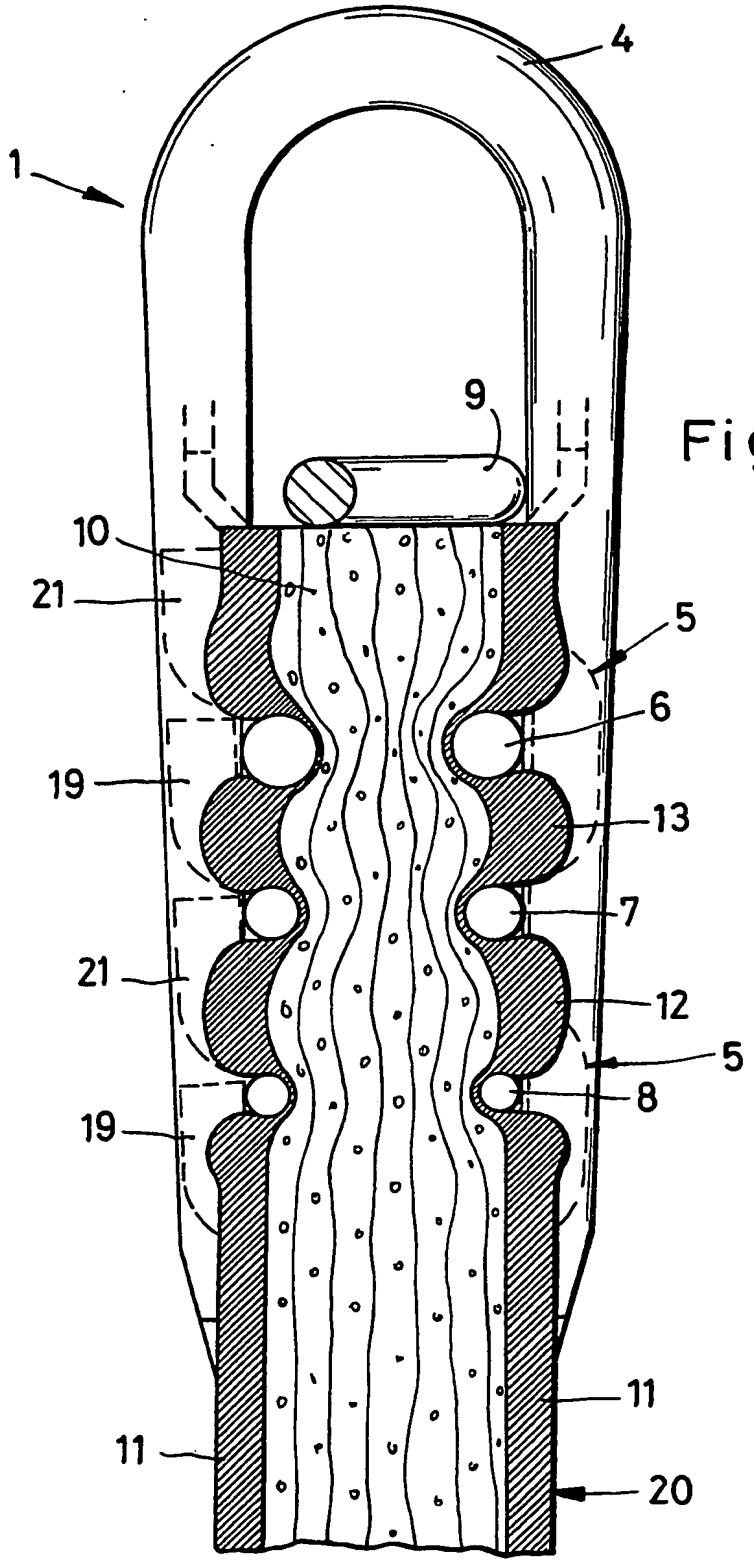

Fig. 4

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Fig.5

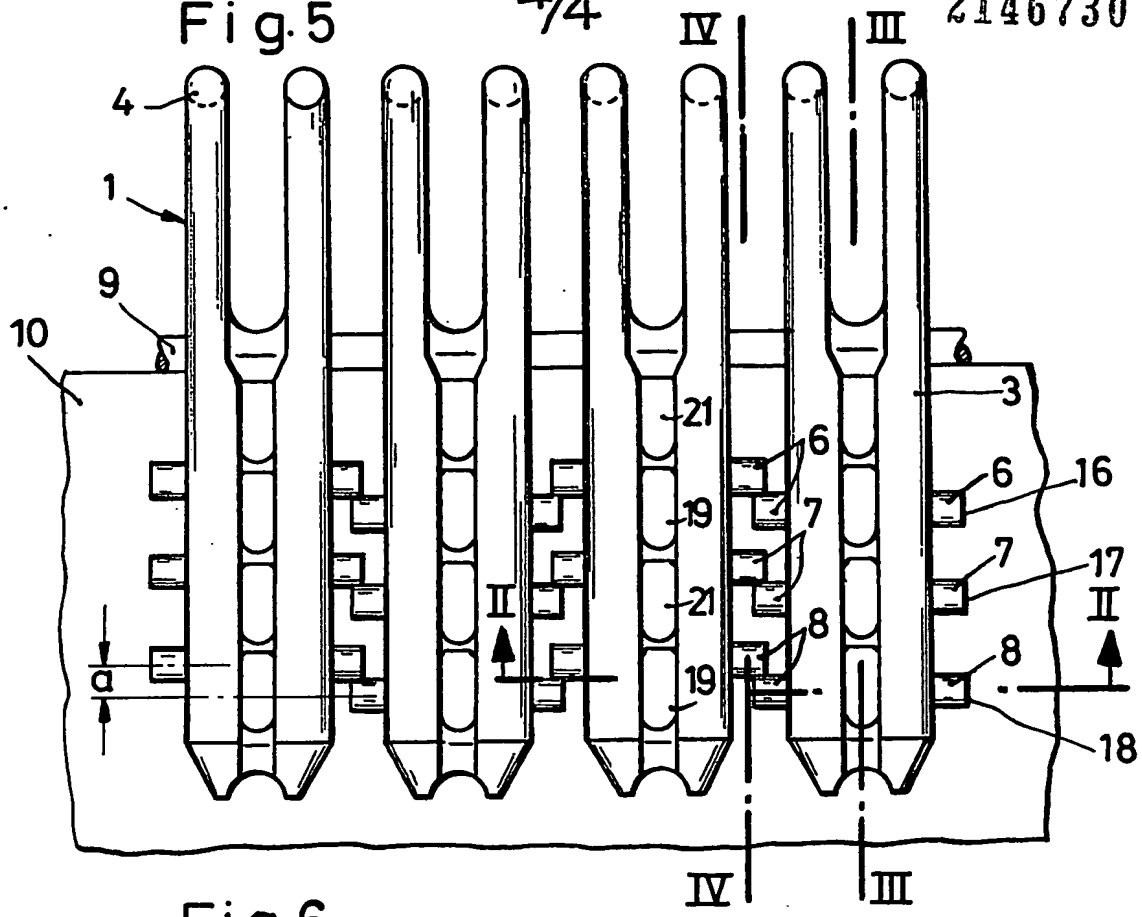
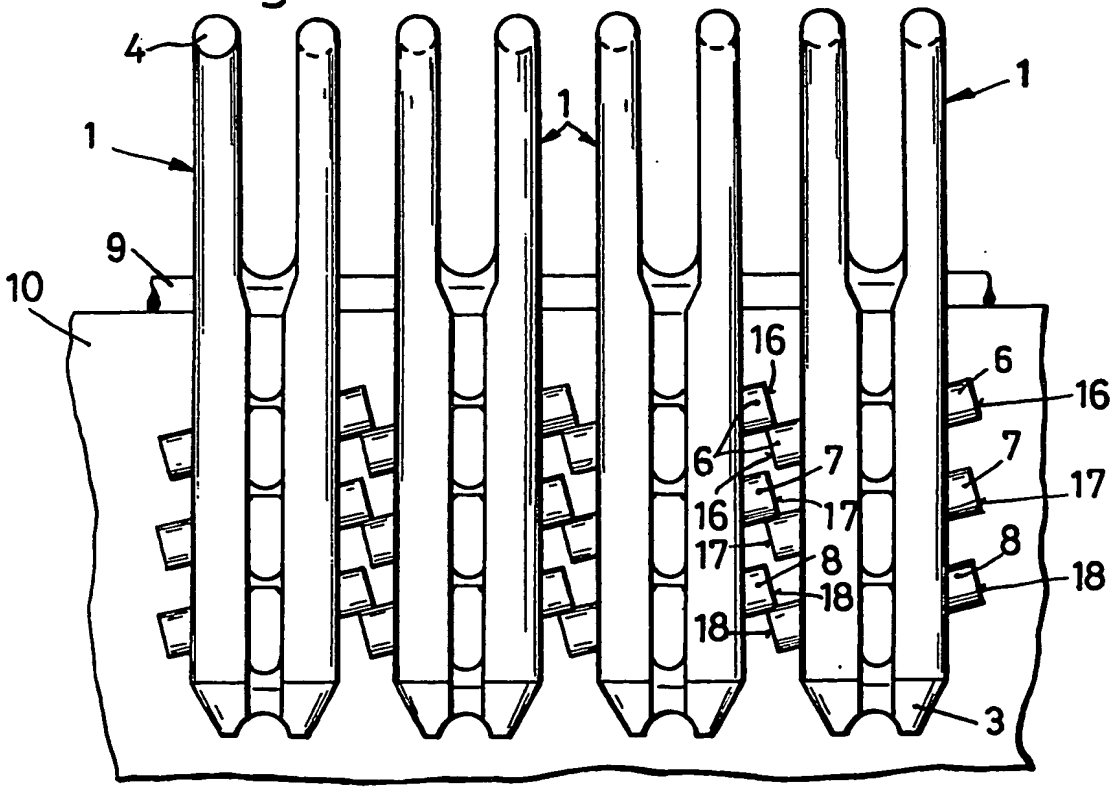


Fig.6



SPECIFICATION

Connector element

The invention relates to a connector element for the belt ends of conveyor belts, which embraces the belt end with its shanks in a U-shape while forming an eye loop. The connector element comprises passing through openings in its shanks for staple-like securing means as well as projections on the sides of the shanks which face each other. These projections extend across the lengthwise direction of the shanks, and can be pressed into the belt surface.

Such a connector element for conveyor belts is known for example from the German Patent 1,186,698. A plurality of such connector elements is attached next to each other with their staple-like securing means to both belt ends. Normally, the stem which forms the eye loop is somewhat narrower than the shanks. The connection of both belt ends is then achieved by means of a rod, which is pushed through the eye loops of both belt ends, after the eye loops have been put into an overlapping aligned position.

In a connector element of the described type, it is already known from German Patent (DE-PS) 1,186,698 to arrange an elevated bump or a projection on the inner side of each shank. This bump or projection presses somewhat into the material on the belt surface, when the connector element is anchored to the belt end by means of the staple like securing means. Therefore, a projection basically improves the holding force of the connector element. The known projection however contributes only insignificantly to this purpose, because, now as before, the arising forces are mostly taken up by the staple-like securing means. It is even a disadvantage in the known connection element, that an additional bending load arises due to the particular position of the projections, when the conveyor belt runs over a drum or guide roller.

Recently, belt webbing material with very high strength characteristics has been used for making conveyor belts. Thus, it is possible to produce belts with only one or two web plies. Such thin conveyor belts, however, are exceptionally sensitive to the staple-like securing means.

It is the object of the invention to increase the dynamic loadability of the conveyor belt connector comprising a plurality of connector elements. In such a connector the forces normally arising during operation are no longer to be transmitted mainly by the penetrating means, for example staple-like securing elements or screws. Instead, these forces are mainly transmitted as clamping and shearing forces acting on the outside of the conveyor belt. Simultaneously, the number of belt fibers previously struck by the staple-like securing means, shall be considerably reduced.

According to the invention there is provided a belt connector element comprising at least two projections arranged on each shank behind one another in the shank lengthwise direction. These projections protrude sideways beyond the shank and their free ends form an intermeshing of the shanks of neighboring connector elements.

In such a construction the staple-like securing means serve primarily for applying and maintaining clamping forces. The loads arising in operation are thus transmitted practically only as clamping or shearing forces. The additional holding force of the staple-like securing means is only of importance when overloads occur occasionally.

Furthermore, the invention provides, that the clamping action in the connector element increases step-wise toward its eye loop. In order to achieve this, prefferably projections with varying cross-sections are provided whereby the cross-section of the projections decreases toward the end of the shank.

Further features of the invention appear from the dependent claims and the specification in conjunction with the drawings.

In order that the invention may be clearly understood, it will now be described, by way of example, with reference to the accompanying drawings, wherein:

Figure 1 is a side view of a connector element on a larger scale, before securing to the belt end;

Figure 2 is a section along the line II-II in Figure 5;

Figure 3 is a section along the line III-III in Figure 5;

Figure 4 is a section along the line IV-IV in Figure 5;

Figure 5 is a top plan view onto several connector elements arranged next to one another on a belt end; and

Figure 6 is a top plan view, as in Figure 5, of a modified embodiment.

A connector element 1 for a conveyor belt or a belt 20 comprises two shanks 2 and 3 interconnected by an intermediate section forming an eye loop 4, after the securing of the connector element 1 to the conveyor belt 20. This securing or anchoring is achieved by staple-like securing means 5. The eye loop 4 allows a rod to be passed through it, for a later connection of the two belt ends to each other.

On the sides facing each other, or rather on the inner surfaces 14, both shanks 2 or 3 are provided with projections 6, 7 and 8. Preferably, these projections are rod shaped, or rather they are in the form of round rods or bars. These projections 6, 7, and 8 protrude sideways with free ends 16, 17, or 18 beyond the shanks 2, 3. Thus, they are longer than the shanks 2, 3 are wide. The protruding ends 16, 17 or 18 of the rodshaped projec-

tions 6, 7 or 8 form an intermeshing between neighboring connector elements 1, as best seen in Figures 5 and 6. For this purpose the connector elements 1 are anchored a small distance apart by the staple-like securing means 5, so that the ends 16, 17 or 18 of one shank 2 or 3 respectively lie in the gaps between the ends 16, 17 or 18 of the other shank 2 or 3 of another connection element 1 (Figure 5 or Figure 6).

In the example embodiment shown in Figure 5, the rod shaped projections 6, 7 or 8 are arranged on the shanks 2, 3 perpendicular to the longitudinal axis of the shank. An intermeshing is thereby achieved in that the projections 6, 7, 8 of neighboring connector elements 1 are slightly displaced by the distance "a" in Figure 5.

In the example embodiment shown in Figure 6 the rod-shaped projections 6, 7 or 8 lie at an angle to the longitudinal axis of the shanks 2, 3 or to the lengthwise axis of the connector element 1. Here again the ends 16, 17 or 18 of the rod-shaped projections 6, 7 or 8 of neighboring connector elements 1 are intermeshed in the assembled state. Due to the slanted or angled arrangement, it may not be necessary that the projections of neighboring connector elements 1 must be displaced from each other by the spacing "a" as shown in Figure 5.

In both embodiments the intermeshing acts as a third element for increasing the dynamic loadability or strength of the connection. Due to the intermeshing connection, a force transmission parallel to the belt end 10 is achieved, whereby the flexibility of the conveyor belt 20 or rather its capacity to form a trough is retained.

As shown in Figures 3 and 4, the penetration depth of the projections 6, 7 or 8 into the conveyor belt 20 is varied, and preferably increases toward the belt end 10. For this purpose the rod-shaped projections 6, 7 or 8 have different cross-sections, whereby the projections 6 with the largest cross-section lie in the area of the belt end 10, whereas the projections 8 with the smallest cross-section are arranged near the free end of the shanks 2, 3. By these features it is achieved, that the bending tensions in the conveyor belt or the belt 20 reach only small tension peaks in the clamping area while the belt 20 is running around drums or other guide points.

Further, several connector elements 1 are, for example, held together in a manner known as such by a waved crosswire 9 before their securing to the conveyor belt 20.

As shown in Figure 4, segments 12, 13 are formed in the cover plates 11 of the conveyor belt 20 due to the penetration or indentation of the projections 6, 7 or 8 into these cover plates 11. The segments 12, 13 also take part effectively in the force transmission when special tension loads arise.

Since the staple-like securing means 5 mainly serve for causing and maintaining clamping and shearing forces, the separation distance of the shanks 19, 21 (Figure 1 and Figure 3) may be relatively small. Thereffore, it is further possible to arrange several staple-like securing means 5 behind one another or even to arrange such securing means 5 in a single row, as shown in Figures 2 as well as 5 and 6. The position and arrangement of the securing means 5 with their shanks 19, 21 is chosen so that the projections 6, 7 or 8 lie between the shanks 19, 21, as shown in Figures 1 and 3 or 4. Especially, the projection 6 adjacent to the belt end 10 and the projection 8 lying the furthest away from the belt end 10, each lie between the shanks 19, 21 of a staple-like securing means 5. This feature has an advantageous effect on the clamping forces to be transmitted.

By using connector elements 1 with intermeshing parts 6, 7 or 8 it is possible to provide considerably fewer connector elements for a complete conveyor belt connection than was previously the case. Furthermore, a much larger number of staple-like securing means was previously required. In addition, with connector elements 1 of the invention a ten- to twenty-fold load alternation improvement has been achieved, compared to customary connector elements. This improvement depends upon the use of the projections 6, 7, 8 with their ends 16, 17, 18 which protrude beyond the shanks 2, 3, and upon the intermeshing of the projections 6, 7, 8 and their ends 16, 17, 18 with the conveyor belt 20 as well as upon the intermeshing of the connector elements 1 with one another. The connector elements 1 form clamping bands running over the total belt width and act on the belt surface by transmitting the arising loads through clamping and shearing forces to the top and bottom sides of the conveyor belt 20.

CLAIMS

1. A connector element for the belt ends of conveyor belts, which embraces the belt end in a U-shape with its shanks while forming an eye loop, comprising openings in its shanks for staple-like securing means and projections on the sides of the shanks facing each other, said projections extending across the longitudinal direction of the shank for pressing into the belt surface, wherein at least two projections are arranged on each shank behind each other in the longitudinal shank direction, said projections protruding sideways beyond the shanks, and wherein the free ends of the projections form an intermeshing of the shanks of neighboring connector elements.

2. The connector element of claim 1, wherein the projection adjacent to the belt end lies between the shanks of a staple-like securing means.

3. The connector element of claim 1 or 2, wherein the projection furthest away from the belt end lies between the shanks of a staple-like securing means.

4. The connector element of claim 1, 2, or 3, wherein more than two projections, preferably, three projections, are arranged on each shank as viewed in the longitudinal shank direction.

5. The connector element of any one of claims 1 to 5, wherein the projections lie parallel to each other and opposite each other.

6. The connector element of any one of claims 1 to 5, wherein the projections extend perpendicularly to the longitudinal direction of the shank.

7. The connector element of any one of claims 1 to 6, wherein the projections run at an angle to the longitudinal direction of the shank.

8. The connector element of any one of claims 1 to 7, wherein the projections comprise different diameters or cross-sections.

9. The connector element of any one of claims 1 to 8, wherein the cross-section or diameter of the projections decreases toward the end of the shanks away from the belt end.

10. The connector element of any one of claims 1 to 9, wherein more than one staple-like securing means is provided, and wherein said securing means are arranged behind one another in a row.

11. The connector element of claim 10, wherein the separation distance between the shanks of the staple-like securing means is small.

12. The connector element of any one of claims 1 to 11, wherein the projections and their ends are rod or bar shaped.

13. A conveyor belt connection, comprising connection elements according to any one of claims 1 to 11, wherein the projections of all shanks form clamping bands running parallel to the belt edge across the entire belt width and acting on the belt surface, whereby the clamping bands are pressed and held tightly into the belt by the staple-like securing means in the shanks of the connection elements, so that the normal operating loads of the belt are no longer transmitted through the staple-like securing means, but instead are mostly transmitted by the clamping and shearing forces effective at the top and bottom sides of the belt.

14. A connector element for a conveyor belt connection constructed and arranged substantially as described with reference to Figures 1 to 6 of the accompanying drawings.

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